

## **A new two-step gradient-type method for large-scale unconstrained optimization**

### **ABSTRACT**

In this paper, we propose some improvements on a new gradient-type method for solving large-scale unconstrained optimization problems, in which we use data from two previous steps to revise the current approximate Hessian. The new method which we considered, resembles to that of Barzilai and Borwein (BB) method. The innovation features of this approach consist in using approximation of the Hessian in diagonal matrix form based on the modified weak secant equation rather than the multiple of the identity matrix in the BB method. Using this approach, we can obtain a higher order accuracy of Hessian approximation when compares to other existing BB-type method. By incorporating a simple monotone strategy, the global convergence of the new method is achieved. Practical insights into the effectiveness of the proposed method are given by numerical comparison with the BB method and its variant.

**Keyword:** Diagonal updating; Weak secant equation; Two-step gradient method; Barzilai and Borwein method